

AD-A066 229 ARMY INST FOR ADVANCED RUSSIAN AND EAST EUROPEAN STUD--ETC F/G 15/7
THE SOVIET RAILROAD TROOPS. (ZHELEZNODOROZHNIKI). (U)
MAR 78 L N BUFFARDI

UNCLASSIFIED

NL

OF |
*AD
A066229



LEVEL II

① SC

AD A066229

**U S ARMY INSTITUTE FOR ADVANCED RUSSIAN
AND
EAST EUROPEAN STUDIES**

DDC FILE COPY



STUDENT RESEARCH REPORT

MAJ LOUIS N. BUFFARDI
ZHELEZNODOROZHNIKI
THE SOVIET RAILROAD TROOPS

-1978-

GARMISCH, GERMANY

APO NEW YORK 09053

DISTRIBUTION STATEMENT

Approved for public release;
Distribution Unlimited

DDC
RECEIVED
NOV 1 1978
RECEIVED

78 10 27 001

R-569/75

ADDITIONAL TO	
DTIC	Write Section <input checked="" type="checkbox"/>
DDC	Defi Section <input type="checkbox"/>
UNANNOUNCED <input type="checkbox"/>	
JUSTIFICATION	
Per DDC Form 50	
BY <i>on file</i>	
DISTRIBUTION/AVAILABILITY STATEMENT	
Biol. MAIL and/or SPECIAL	
A	

LEVEL II

①

⑨

Student research rept.,

⑥

Z H E L E Z N O D O R O Z H N I K I)

THE

SOVIET RAILROAD TROOPS.

⑫

35 p.

⑩

Louis N. Buffardi

Major, USA

⑪

March 1978

DDC
RECEIVED
NOV 1 1978
D

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

420 192

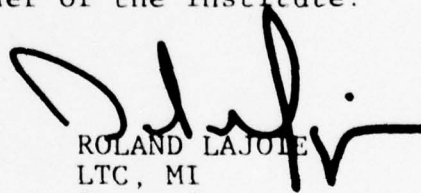
elt

FOREWORD

This research project represents fulfillment of a student requirement for successful completion of the overseas phase of training of the Department of the Army's Foreign Area Officer Program (Russian).

Only unclassified sources are used in producing the research paper. The opinions, value judgements and conclusions expressed are those of the author and in no way reflect official policy of the United States Government; Department of Defense; Department of the Army; Office of the Assistant Chief of Staff of Intelligence; or the United States Army Institute for Advanced Russian and East European Studies.

Interested readers are invited to send their comments to the Commander of the Institute.


ROLAND LAJOTTE
LTC, MI
Commander

SUMMARY

In this paper, the author provides a comprehensive treatment of the Soviet Railroad Troops predominantly derived from an analysis of open Soviet sources. Major topics relate to historical development, mission, organizational analysis, equipment, and experiential factors evolving from the Baikal-Amur project and problems encountered. A comparison is made with US military rail transportation resources in order to better place the Soviet findings in perspective. He concludes that the Soviet Railroad Troops are well-trained, professional, and have proved themselves a viable force in the trying conditions extant on BAM. In providing a backdrop for the study on the railroad troops themselves, the author touches upon the Soviet perceptions of military rail transportation in wartime conditions. To this end, despite some expressed Soviet doubt as to military railway effectiveness, the author points out several positive Soviet measures toward building a military railway reserve which implies that this mode is still of significance in contemporary Soviet military thought.

HISTORY

Official Soviet sources cite the year 1851 as the beginning of today's Railroad Troops.¹ At that time, work was predominantly accomplished through military labor companies as the force originally consisted of 14 of those units with two construction companies and one telegraph company. Imperial Russian Army organization included these railroad forces within the overall engineer forces.

The first of many reorganizations took place in 1864 when these separate units were reformed into a military labor brigade. With a recognition of the need for specialized training came the establishing of a training cadre to organize and conduct training in 1870.

In 1876, the First Railroad Battalion was formed in the Russian Army and two more battalions were added one year later. This was somewhat timely in that with the advent of the Russo-Turkish War of 1877-1878 the Railroad Troops gained considerable experience and were put to good use. Despite what must have been arduous conditions and working with primitive tools and equipment, the Railroad Troops succeeded in building a rail line of 300 km between Benderi and Galatz in the space of 100 days--a respectable rate of 3 km per day in those days.

Considerably more experience was gleaned in the succeeding years as the troops constructed almost 1500 km of line between 1880 and 1888 extending from the eastern shore of the Caspian Sea to Samarkand. On the eve of the Russo-Japanese War, the railroad troops had constructed a line from Vladivostok to Khabarovsk and completed the construction of the Chinese-Eastern railway. During the Russo-Japanese War, the troops operated their rail equipment and rolling stock in performing such tasks as movement of troops and equipment, evacuation of the sick and wounded, and also construction of narrow gauge rail lines with horse-drawn traction, and also earthen roads.

Another organizational change came about just prior to the Russo-Japanese War when the railroad troops were transferred from the Main Engineer Directorate to the Directorate of Military Communications of the General Staff. Railroad brigades were formed from the nuclei

of the railroad battalions. The cadre-level of instruction was significantly upgraded by the creation of specialized training institutions for the railroad troops.

The role and size of the railroad troops grew significantly during the course of the First World War. Operationally, two to three brigades were assigned in the rear of each front performing work in restoring, constructing, and protecting existing and new rail lines. To facilitate work over vast distances, new means were adapted to include the creation of the forward repair trains or GOREM's (golovnye remontnye poezda). Equipment types included conventional rolling stock, steam engines, and armored trains. Railroad Troop strength by the end of the war numbered about 130,000 men.

In the course of the subsequent Civil War, railroad troops were created in the Red Army of Workers and Peasants (RKKA) by an official order of 5 October 1918. A special directorate was created for the leadership and management of the troops. In 1919 separate railroad companies were reorganized into railroad battalions and brought together to form railroad brigades.

The Civil War provided yet another training ground for the railroad forces as they participated actively on all fronts. Between 1918-1920, they restored 22,000 km of railroad and more than 3,000 bridges with a total length of 74 km, repaired 16,500 railcars and operated the rail network transporting supplies, equipment, and troops. Five of the railroad units were singled out for award of the Revolutionary Red Banner.

With the conclusion of the Civil War in 1921, another reorganization took place with the creation of Railroad Regiments. These regiments were principally engaged in the restoration of the rail lines in the country in the wake of the destruction of the Civil War. They continued to operate in the regimental framework until 1926 when, in connection with the wide sweep of railroad construction in the country, a special corps of railroad troops, the RKKA, was formed which continued until 1941 under the Peoples Committee for Communications. Again, the principal functions performed were that of restoring existing lines and building new ones.

In 1941 another reorganization of the railroad troops began. This entailed a functionalization of organization in that units were to be created to perform certain specific specialties, e.g. route-laying, bridge-building, and equipment operation. Soviet sources are divided on the question of the 1941 reorganization which was interrupted by the German invasion. From a historical standpoint, the predominant evidence gleaned from memoirs and the like indicates that if the reorganization were not complete, it was at least extensive enough to reflect specialized units within brigade organizations. This will be treated further in the chapter on organization.

The German attack caused the Soviets to evacuate as much of their rolling stock and associated equipment as they could. Forming up as best as possible in the fluid "rear", railroad units often found themselves the only forces available to combat the Germans. Many of these units distinguished themselves in direct combat, such as the 28th Separate Railroad Brigade which, due to its valor, later was redesignated the First Separate Guards Railroad Brigade.²

As opposed to new rail construction, the predominant rail work performed during the Great Patriotic War involved rail and bridge restoration. In all, during that period the railroad troops restored more than 117,000 km of railroad and operated 443,000 troop and supply trains totalling upwards of 20 million cars. Of interest is the fact that not all of the rail lines were on Soviet territory, but included about 36,000 km of railroad line of "foreign origin"--that is on the bordering states to the east and west of the Soviet Union.

The variety of work performed included the restoration of more than 15,000 bridges and conduits, 700,000 km of communication lines wire, thousands of water supply points, and dozens of tunnels. Further, railroad mine specialists removed and deactivated more than two million mines and landmines, and 60,000 aerial bombs.³

After the war, once again the railroad troops were engaged in reconstruction of damaged and destroyed rail lines, bridges, and adding double tracks, new lines, stations, depots and other facilities. Between 1946 and 1975, the railroad troops had constructed almost 27,000 km of new rail line and more than 13,000 related structures.

Railroad troops actively began to take part in the construction of the Baikal-Amur Magistral in the 9th Five-Year Plan. At present, this continues to provide practical field training for the majority of the railroad troops.

MISSION

The mission of the Soviet Railroad Troops is to restore, build, operate, and protect railroads in wartime conditions.⁴ This caveat, "in wartime conditions," is misleading for the Soviet Railroad Troops are demonstrating their abilities today on BAM, as they have for the past three years, in non-wartime, albeit primitive, conditions.

Further, the role of the railroad troops in the civilian economy is significant. For example, the Chief of the Railroad Troops of the Soviet Army, Colonel-General Kriukov, himself stated:

It is perhaps difficult to mention a single road in our country, in the restoration, building or rebuilding of which the railway troops have not taken part.⁵

In some respects it is difficult to disassociate completely the military from the civil rail operations as the latter is in and of itself para-military in nature. Military personnel are actively engaged in controlling some shipments by rail,⁶ and especially in troop movements such as those conducted in high-rail-density areas as Moscow.⁷ In a very real sense, this close military-civil cooperation actually is a most beneficial arrangement. On the one hand, it allows for real-life training for the very active military railroad force, and on the other hand not only does not detract from the civilian railroad labor force, but actually supplements it.

The Soviet mission significantly varies from that of the United States Army Railway Transportation units in that these US units are organized and equipped to do all but build the railroads. This task is regulated to the US Army Corps of Engineers, specifically it is one of the multiple functions of the Engineer Construction Battalion (Heavy).⁸

Another significant difference lies in the fact that the Soviet railroad troops are more actively engaged in day-to-day operations than our US units which are predominantly cadre units or small operational units engaged in freightyard operations. Finally, our US rail units are principally concerned with the operation of foreign rail lines and the use of foreign equipment. The Soviet railroad troops have their own rolling stock with which they train. US rail operations philosophy envisions an incremental turning over of rail operations to the host country while there is no evidence of such a philosophy prevalent among the Soviets.

Thus, in any analysis of Soviet railroad capabilities, it must be borne in mind that there is a higher capability for independent operations than is the case with the US Army. In the associated area of operation and maintenance of rolling stock there is greater commonality.

As with all military forces, the Soviet Railroad Troops have the secondary mission to fight as infantry when called upon to do so. The much documented Soviet experience during WWII pointed out a plethora of these examples.⁹

ORGANIZATION

In the notable absence of any documents which clearly define the organization of the Soviet Railroad Troops, recourse was made to the available Soviet military literature, predominantly historical in nature, for specific data. Two of the works reviewed provided fair insight into the probable organizational structure of the Soviet military rail transportation organizations. Unfortunately, these sources extend only through the Great Patriotic War.

From the stated mission, it is known that certain essential and distinct functions must be performed. These are track-laying, bridge-building, equipment operation, equipment maintenance, and the necessary administrative functions performed by any organization.¹⁰ It is also known from the historical sources that units were organized in company, battalion, brigade, and at times regimental configurations. Predominant mention is made, however, of the brigade formation being the

largest railroad organization. Previous employment of Soviet Railroad Troops in wartime conditions saw a distribution of between two to three Railroad Brigades "in the rear of each front."¹¹ Railroad brigade organizations are also mentioned today with respect to work on the BAM.¹²

The 1941 reorganization of the railroad troops called for specialization of units.¹³ In the historical sources, a great number of units are identified by type and size. For example, one work identified upwards of 30 numbered railroad brigades.¹⁴

At the battalion level we begin to find a breakdown as to function. Among the units identified are found, for example, the 32d Bridge Battalion, the 11th Equipment Battalion, the 76th Route-laying Battalion, the 9th Mechanized Rail-laying Battalion, and so on. Operating units, those which are concerned with the operation of the rolling stock, are predominantly identified as company-level organizations such as the 54th Rail Operation Company.¹⁵

Other type units found included units such as the 10th Frontal Railroad Park, rail forward restoration units (golovnye vosstanovitel'nye otriady--GVOT), mobile forward repair trains (golovnoi remontno-vosstanovitel'ni poezd--GOREM), railway mine deactivation units, and communications detachments. While contemporary press reportage identifies track-laying units and bridge building units, a reference was also found in a 1974 Krasnaia Zvezda which alludes to a "forward mechanized party" which has the mission of "dynamiting cliffs and constructing embankments."¹⁶

Rounding out the known parameters of Soviet Railroad Troop organization, the historical sources seldom refer to more than two subordinate battalions within a brigade. But this is not sufficient reason to exclude the possibility that a type brigade could contain more than two battalions. One of the most tangible figures found for Soviet Railroad Troops, albeit dated, gives a figure of 12 separate railroad brigades, containing 48 railroad battalions, one supply battalion, and two equipment parks, with a total troop strength of 23,000 in the beginning of 1920.¹⁷ A possible ratio then of about four battalions per brigade would appear not only reasonable, but considering the specialization of the subordinate battalions, quite probable.

From the standpoint of personnel staffing, considering the fact that the USSR has not deigned to provide figures about their armed forces, if an extrapolation of the above break-out were to be used as a guide, it may be said that a Soviet railroad brigade consists of about 2000 men, each battalion about 450-500 men, and a railroad company about 110-125 men.

The historical sources identified command rank structure as follows: brigade--commanded by a colonel; battalion--commanded by a major; company--commanded by either a senior lieutenant or captain, as references were found for both.¹⁸

Given the separate functions which must be performed within an operational sector by a specific rail organization, it may be possible to diagram a type Soviet railroad brigade as depicted in Diagram A. For comparison purposes, US Army transportation railway units are briefly highlighted in ANNEX A.

A comparison of the US and Soviet units immediately points up several principal differences. While train operation, railway maintenance, and equipment maintenance units are fairly well in line in both organizations, the Soviet organization includes the additional functions of building the railroad beds, ballasting, and laying the track.

Diagram A is provided solely to graphically portray a possible Soviet railroad brigade organization. As with US railway organizations, no two will necessarily look alike in that the areas in which they operate may differ (e.g. in the Soviet case there would be no need for a bridge battalion in an area containing no rivers, canals, chasms, etc.), the density of rolling stock may differ thus influencing the number of rail operation companies assigned, and the availability of existing track will influence the number of route-laying, ballasting, and track-laying units.

Early Soviet railway organization reflected an equal number of mobile repair/overhaul trains as there were battalions. Based upon this it is possible that there may be at least one GOREM per brigade in support of the co-located battalions of the brigade. An equipment battalion may or may not be attached depending upon whether or not there is an established equipment

park servicing the railroad brigades located in a front. A railroad brigade operating more-or-less independently on the BAM may require the attachment of such a unit. This may also be the case for supply functions. Unfortunately, no specific data can be found to establish a finite table of organization and equipment, thus the need to draw conclusions based on available historical evidence, functional analysis, and a comparative approach utilizing a known factor in rail organization (i.e. US transportation rail organization philosophy).

Specialized units referred to earlier such as the railway mine deactivation teams may also be attached as necessary thus further altering the type organization. As a final comment, it should be pointed out that the diagram is not intended to imply that only one of each type of unit depicted may be found in a type brigade. As with US logistics development, the workload required to be performed will dictate the number of units to be assigned. Thus, while one brigade may operate only on earthen roadbeds and not require any bridge units, another brigade may well have two or more such units attached if its area is criss-crossed with a multitude of rivers, creeks, chasms, culverts, etc.

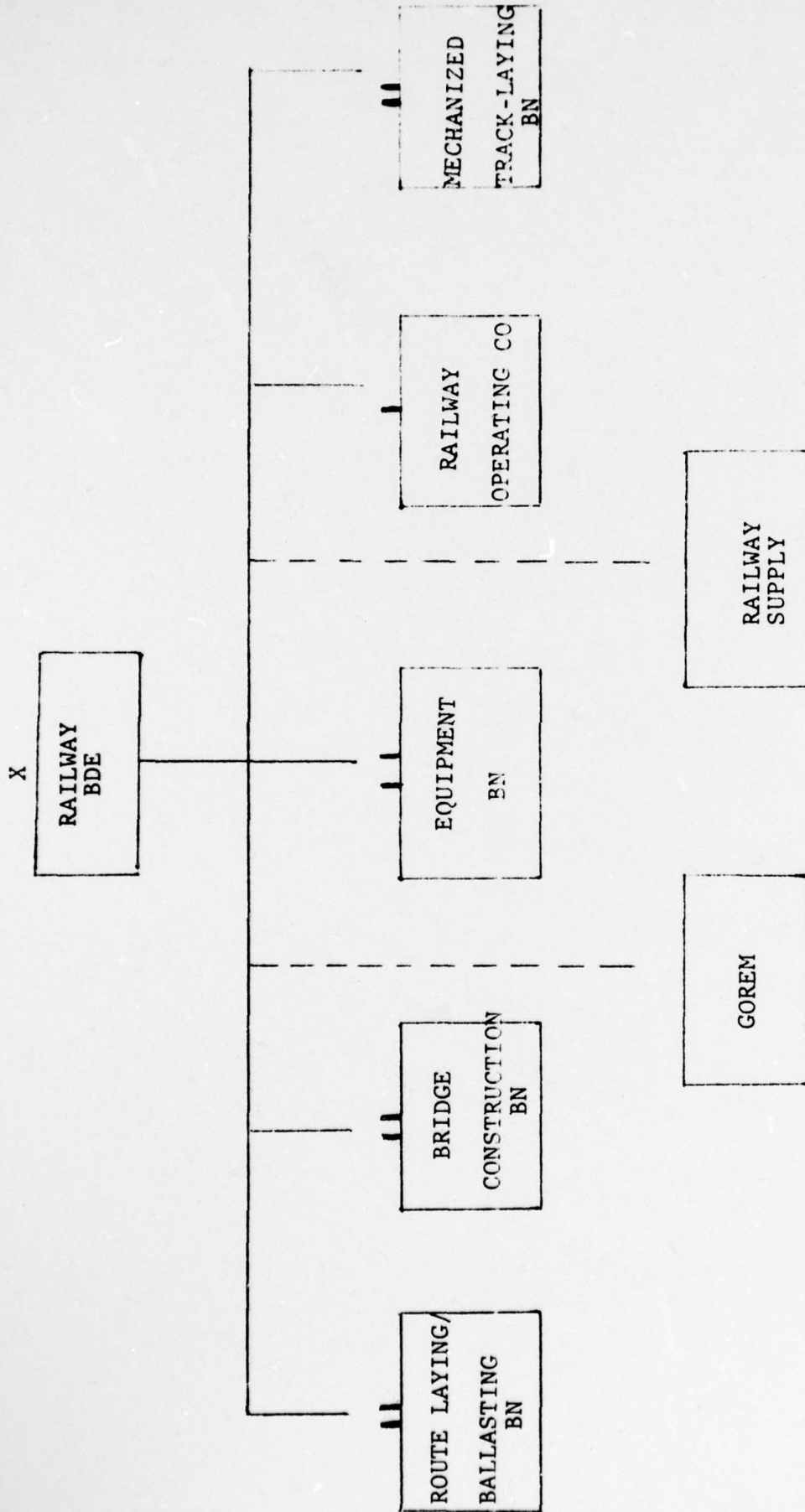


DIAGRAM A

Possible Soviet Railway Brigade Organization (Type Bde.)

EQUIPMENT

According to Colonel-General Kriukov, construction work has been mechanized to the highest degree possible:

For instance, the level of mechanisation of earthwork in making embankments and excavations, laying the upper structure of the main road is now 99 per cent, that of ballasting the road 94 per cent, loading and unloading work 97 per cent.¹⁹

The Soviet Railroad Troops employ the usual array of trucks, tractors, cranes, excavating machines, generators, and specialized bridge and track systems equipment. Some of these latter types of equipment operate both in the automatic and semi-automatic modes, and also employ remote control, electronic systems, and hydraulic drivers.

The NZh M-56, floating railroad bridge, for example, is designed for the construction of a complete floating bridge with a length of up to 530 meters in the course of one and one-half days.²⁰ This bridge can accommodate locomotives of all types at a speed of up to 20 km/hr, "columns of automobiles" weighing up to 10 tons each at a speed of up to 30 km/hr without a requirement for minimum spacing between vehicles, or tracked vehicles weighing up to 50 tons. The bridge features a cut bay which allows for the passage of ships.

The REM-500 dismantlable trestle²¹ may be erected to permit railroad crossings of water obstacles with a depth of up to 7 meters and with a width of up to 500 meters. Further, the trestles may be employed across gulleys or small valleys, and also for spanning large gaps in the embankments of railway lines.

Dismantlable cantilever cranes are employed in assembling and positioning the trestles. According to the Soviet press, the trestles can be positioned at a rate of 400 meters per day.²² Once assembled, the trestles may be crossed by wheeled and tracked vehicles as well as trains.

Pile drivers, also capable of being dismantled for speedy deployment where and when needed, are widely employed. Diesel powered pile drivers described in several sources feature hammers which effectively deliver a

ramming force of 500, 1250, and 1800 kilograms. These pile drivers are capable of driving in both wooden and reinforced concrete piles up to 40 x 40 centimeters and up to 12 meters in length.²³

The pile drivers may be found on a variety of mountings. These include mobile dismantlable pile drivers, gantry cranes, armored personnel carriers, vehicular and floating cranes. The wide variety of potential mounts for the pile drivers permits the driving in of piles vertically or inclines, on land or in the water, or even "driving in several piles without repositioning the pile drivers."²⁴

Cantilever cranes, including those with a floating capability, are capable of carrying a load of 50 tons and positioning railroad spans with a length of up to 33.6 meters. The rail sections, delivered to the site by rail or by truck, are positioned by a special KRAZ vehicle which features a dual-purpose chassis, allowing it to be either rail or road transportable.

PLK-10 rotary and derrick cranes are used in the actual assembly of the span structures. With its boom extended 4 meters, the PLK-10 can raise a 10-ton load to a height of 25 meters. The PLK-10 can be mounted either on a railroad track or on pontoons for water-crossing emplacement.²⁵

Auxiliary equipment which permit track assembly in field conditions include light track-layers, ballasting machines, equipment for machining of the rails and finishing the track, and drilling units such as the UKS-22 for boring holes.

A "section assembly stand" is referred to by the Soviets for the assembly of small volume track sections. It apparently features low automation and is employed for basic section assembly operations.²⁶

A tractor "track-layer" is used for the laying of ready-made track sections with wooden and reinforced concrete ties and, if necessary, for the dismantling of the track.²⁷ One journal article stated that it is not only transportable, but is "simple to operate."²⁸

A track lifting and aligning machine is another of the mechanized items of equipment referred to in Soviet

journals. This machine raises the track section and places it onto the ballast. The machine has a capability of lifting the track skeleton to a height of up to 400 mm and to displace it to the side up to 300 mm.

A trailer-type electromagnetic continuous-operation track-lifter is employed for large track-lifting operations. Its lifting capacity is 38 tons and with it, a track-emplacing capability of up to 2 km per day can be attained.

In line with this increased sophistication of railroad building equipment, a comprehensive program was also developed to train the personnel to "effectively" and "productively" operate the equipment. By 1977, 22 simulators, mock-ups, and other training devices had been developed for technical training at the M.V. Frunze Academy of Railroad Troops in Leningrad.²⁹

That sophisticated rail construction equipment and methods may exist to the degree touted is exemplified by the Dneper exercise, conducted more than 10 years ago, in which the Soviets set up a floating railway bridge in what they claimed was "several hours."³⁰

Locomotive equipment itself has received such considerable emphasis that by 1974 the Soviets could claim that 99% of freight turnover was accounted for by electric and diesel locomotives.³¹ As of January, 1976, two thousand Czech-built diesel locomotives were in service in the USSR alone.³² The Soviets predict that at the end of the current Five Year Plan, "the railways will receive 2,200 new electric and nearly 9,000 diesel locomotives, 386,000 freight cars and 16,600 passenger cars. The level of mechanisation of freight handling will be raised to 93%."³³

Military rolling stock is predominantly made up of four axle, 60-ton capacity cars of varying types.³⁴ As will be seen below, there is a possibility that the great numbers of locomotives in storage may be set aside for military use. These locomotives are steam-driven thus permitting possibly more reliable service in combat conditions in that they are independent of electrical power sources and interruptions in the flow--and priorities--of diesel fuel.

A group of travelling American railwaymen visiting the USSR in 1974 helped shed some further light upon how

the Soviet railway system operates. Their observations included the following:

a. There are "several hundred steam locomotives still at work on yard and work-train assignments in Siberia" and these are "principally of American manufacture" consisting of part of the 3,000 engines provided by the U.S. "under lend-lease or similar programs to Russia during World Wars I and II."³⁵

b. High-sided gondolas were seen with drop-ends for log, lumber, and forest products service, with a nominal capacity of 63 metric tons.³⁶

c. 40-foot boxcars are widely used, most fitted with roof hatches for loading of grain and other bulk granular materials.

d. Large fleets of drop-sided flatcars were observed.

e. Tank cars with a capacity averaging 12,000 gallons or more were also seen.

f. High capacity 102-ton steel gondolas are fitted with 16 drop-doors, roller bearings, and the air brakes which are standard throughout Russia.

g. "In a few instances exceptionally large-capacity tank cars using span-bolsters over two four-wheel trucks at each end of the car were observed in unit oil trains."

h. Refrigerator cars were also seen. The bodies were of galvanized steel or sometimes of fiberglass. The trend is to use these cars in permanently coupled units of 18 with a two-unit power-car manned by a full-time attendant sandwiched in the middle. All elements are coupled either by electric jumper cables or by a three-foot diameter flexible bellows-connection between all cars for circulation of cold air.³⁷

Literature available on BAM construction has indicated the use of R-65 type rails with specially treated wooden ties on a crushed rock ballast and sand cushion. The peculiarities of the area also require various protective structures against cave-ins, land slides and avalanches. These structures include retaining walls, galleries, and other shelters and sheds for personnel. ³⁸

The gradient of the BAM line has been reduced from 0.018 (18 meters per km of route) to 0.014. Mobile maintenance shops are widely employed on BAM. These include maintenance shops MTO-AT, A-701, and MTO-3c which are mounted on ZIL-130 and ZIL-131 trucks. These shops are equipped with tools and equipment to perform bench-work welding, adjustments or calibration work, lubrication, and also have supplies of hydraulic and "flushing" fluids. Temporary repair facilities, designated PTO, are also employed for work in field conditions. These are usually housed in covered frame, log, or prefabricated panel buildings. Two other factory produced, collapsible maintenance shops are the IRP and PRT.³⁹

Mobile automatic electrical-power generators, AC-500 of 500 kw capacity are known to be in use on BAM. In the 1975-1977 period alone, equipment deployed for BAM construction included "nearly 1200 excavators, more than 400 bulldozers, more than 7.5 thousand trucks, and many hundreds of wheeled, pneumatic-tire cranes such as the K-162, and track and railroad mounted cranes such as the 120-ton capacity GEPK-130. Also employed are the VPO-3000 tamping-finish machines, and also snow removers, boring and boring-crane machines, turbojet borers, and other devices".⁴⁰ T-100M and DET-250 tractors are also employed with adjusted settings on the track to allow for effective use during periods of heavy frost.⁴¹

None of the articles mentioned weapons or other military equipment. However, in a sequence devoted to Railroad Troops called "Soldat BAMa" on the Soviet television program "I serve the Soviet Union," railroad troops were seen "defending" their rail line from an "aggressor attack" using AKM assault rifles.⁴² These weapons were centrally located and some of the troops had to go and get them at the commencement of the "attack." Other troops were seen "patrolling" the line at the time of the attack and were already armed thus enabling immediate "defense" of the line. Apparently during construction or repair work, a team is designated to patrol the work site at all times.

Although no other weapons were seen, it is plausible that a military train operating in combat conditions may be also armed with up to three SA-7's--one in front, one in the center, and one at the end of each train--and one or two RPK machine guns.

From the available sources, it is obvious that military technology has not been found wanting vis-a-vis the railroad troops. By and large, the major problems encountered have been not with the equipment, but with the operators and the conditions under which the equipment must function. These conditions recently have been principally that of heavy frost in the Siberian expanses which takes a toll of the mechanization of work and, in part, militates against advanced mechanized work. As a result, a great deal of manual labor is still expended by the troops.

TRAINING

Training of railroad troops is both formal and informal. Formal instruction is conducted at the Moscow Academy of Road and Engineer Forces, and at the Leningrad "Red Banner" Frunze Academy. While instruction at the former is more general in nature, including a four-year curriculum qualifying graduates as engineers in construction of highways and bridges, operation of railroad, water, and air transport,⁴³ the instruction at the Leningrad academy is specifically oriented to instruction of railroad personnel.⁴⁴

The Leningrad academy offers a secondary military education and an engineer's diploma. An officer can obtain a higher military education at the Military Academy of the Rear and Transportation.⁴⁵

These formal courses are open to officers and those aspiring to become officers. Enlisted men--other than those opting for and selected for officer level training at the above institutions--receive their training either on the job, as when assigned with skilled instructor cadre on BAM, or through evening classes or correspondence course.⁴⁶

Openings at the various academies are advertised annually such as those which appeared in Krasnaia Zvezda in March, 1975, announcing openings at the Leningrad Military Academy of the Rear Services. The training was described as including both construction and operational instruction relating to railroads.⁴⁷

The film "Soldat Bama" depicted several scenes dealing with the conduct of instruction at the Leningrad academy. The curriculum, according to the narrator,

includes party affairs, international relations, and technical instruction. Emphasis was placed on the wide use of computers in training, metallurgical studies for rail application, and the use of mock-ups and models for grader, excavator, and switching operations.

But for the bulk of railroad troops, training is an on-the-job process. One article discusses at length how young replacements are given this training on BAM.⁴⁸ Basically, it involves a form of apprenticeship in which the replacements, normally high-school graduates, are assigned to work with experienced mechanics and equipment operators in quarries or on runs. This is referred to by the Soviets as the "BAM university."⁴⁹

EMPLOYMENT

Railway transportation support to the Soviet Army is usually accomplished through the use of railheads normally found in each army area. These railheads normally accommodate "all supply trains within a radius of 60 to 95 miles of the operational sector."

The railhead serves three to four central depots located about 15 to 20 miles behind the battlefront. Each depot serves two to three divisions through a road network. Therefore trucks are used only for the final 15 to 20 miles separating the central depots from the frontline units. But the rapid advance of Soviet mechanized forces in Czechoslovakia showed this entire concept to be hopelessly outdated.⁵⁰

Unfortunately, neither the observer who made the statement above nor the Soviets have deigned to enlighten us as to what new methods are being employed. Not only is there a lack of concrete data with respect to units, manpower, assigned equipment, and specific capabilities, but one is also left somewhat in the dark as to employment. Wherever possible, specifics are presented to aid the reader in piecing together general operational tendencies.

Soviet railroad operation is characterized by "extraordinary high density" in peacetime:

Freight trains operate at about 50 miles per hour and on such close head-way as to be running more often than not in ABS signal territory, on the yellow block of the preceding train. Consists (trains) vary between 50 and 65 cars headed in non-electric areas, by a two-unit opposed-piston diesel locomotive manned by a 'machinist' and his assistant.⁵¹ There is no train crew and no caboose. The rear of the train is designated by a white-bordered red disc hung from a convenient grab iron at the end of the rear car.⁵²

This citation is interesting in that it illustrates how the Soviets perceive the effective employment of rail equipment to get the greatest density of rolling stock to its destination in the shortest time with the least amount of personnel. Certainly, if valuable or dangerous cargo were being moved, it is probable that a caboose would be added or that guards might ride the cars. But the fact that the Soviets tend to move their trains on the same track one behind the other before the track is clear, i.e. "green", is significant. It is reminiscent of their World War II practice of employing trains within sight of each other to attain maximum rail density.⁵³

It may well be argued that this method could not be effectively employed in the face of serious air interdiction in a wartime scenario. Thus far, the only evidence available is that this is the system the Soviets did in fact employ in the face of Luftwaffe controlled skies, and that it may say something about their current air defense posture. But as will be seen below, it is not expected that the Soviets will place too great a dependence on the rail system due to its admitted inherent vulnerability in a tactical environment. From a transportation standpoint, however, the capability to move vast quantities of heavy, outsized military equipment over extended distances which is offered by this mode, is quite a difficult asset to ignore on the strategic level.

MILITARY ROLE OF RAIL TRANSPORT

The contemporary Soviet view of railway transportation in military operations continues to be that voiced by Sokolovski in his Soviet Military Strategy enunciated more than a decade ago. This view basically holds that "truck transport, pipelines, and aircraft will have the dominant role in military theatres" while a mix of all forms will be necessary within the country.⁵⁴ The principal under-

lying factor given is the vulnerability of railways to nuclear attack and that they "are more difficult to re-establish in operation."⁵⁵

Nevertheless, citing performance during the Great Patriotic War, Sokolovski maintains that the 10 to 23 per cent of the nation's operating stock of railway cars which was "required for the transport of military freight" is not viewed as decreasing "under present conditions."⁵⁶

To better prepare the railway system for war, Sokolovski cites the following measures taken to ensure survivability:

1. creation of a denser railway network which will permit bypassing of destroyed areas,
2. ensuring the rapid reconstruction of railway lines,
3. building distant bypasses around railway junctions and tunnels,
4. use of railways of different gauges,
5. preparing transshipment areas, and
6. creating reserves of railway capacity.⁵⁷

Creation of reserves of railway capacity is significant in that it relates more to a qualitative increase in effectiveness than to a quantitative increase in types of equipment. Sokolovski provides specific guidance which includes:

1. accelerating loading and unloading procedures by widespread mechanization ,
2. introducing containers and standard-size packages, "which will cut down wasted space in railway cars and increase their turnover," and
3. increasing the weight of the trains and their speed.⁵⁸

According to the Soviets, "up to 50 per cent of military cargoes in combat conditions will be carried in containers and 30 per cent in packages."⁵⁹ Not only does this method cut down on loss and pilferage, but contributes greatly to the reduction in turnaround and transshipment time.

Further bolstering the Soviet railway reserves is the fact that along the Trans-Siberian are a number of major terminals which have special locomotive storage yards "set up to accommodate thousands of 'stored-serviceable' steam locomotives of a large variety of types and wheel arrangements. In most cases the cabs are boarded up, headlights boxed in, and the engines moth-balled with a heavy black preservative material."60

Given a relatively protected or quickly repaired railway line, these steam locomotives could well operate off the forested lands of Europe totally independent of diesel fuel or electric energy shortages or interruption of supply.

From an overall standpoint then, the Soviets have increased their rolling stock to include retention of steam locomotives while yet accruing more diesel-electric locomotives. It would appear that the Soviets have sought to achieve a position of maximum flexibility which would allow widespread use of railway transportation for military support even though it is somewhat downplayed by Sokolovski himself--though this may well be in the tactical-level context. In and of itself, this may be ample evidence that there are those in the Soviet military who consider rail transport to be considerably more important in the event of a protracted conflict.

CAPABILITIES

One of the most frustrating factors in undertaking this study was the overwhelming lack of definitive material concerning the Soviet railroad troops. As in the case of organization, extrapolations were necessary in order to approximate as nearly as possible a "type" unit. In so far as capabilities are concerned, the analyst is compelled to either ignore them, or to extrapolate from extrapolations--a dangerous method as the outcomes are all too often construed to be fact rather than hypotheses.

No material was found which stated that a specific unit, containing so many personnel, could accomplish a given task, within a specific time frame. We do, however, have material which relates to overall Soviet Plan fulfillment which tells us something of their capabilities. This however is caveated as well in that the figures will necessarily relate to the outputs of both the military and the civil sector as they are combined in overall reporting. Military personnel working on BAM for example

are working side by side with civilians. Thus, even if it were known how many brigades were at work on BAM and the precise extent of their sectors, any given total output figures would be meaningless in that they would not relate specifically to a military unit operating for a given period of time.

Other than the figures cited above in the historical treatment of the Soviet Railroad Troops, reliance is made on contemporary, that is peacetime, figures. While no attempt is made to conclude that the rate of peacetime work will compare with the rate under wartime conditions, it must be kept in mind that the fulfillment of the Plan is an impetus to productivity. Further, while this may not constitute the same incentive as a wartime task, there is also the absence of wartime interference of work in all its devastating forms. Considering the harsh conditions prevalent along the BAM construction sites, such interference is not all that absent as one might imagine.

Figures that are known include a claim that about 2,000 km of new rail construction was completed each year of the Ninth Five Year Plan (1971-1975) in the Asiatic USSR.⁶¹ If we extrapolate from this, and use a dividing factor of 50 weeks (allowing 2 weeks for weather, celebrating of Lenin's birthday or anniversary of the revolution, etc.), we arrive at a figure of about 40 km/week in rather harsh, certainly primitive conditions. Depending upon the dividing factor subsequently chosen, whether 5, 6, or 7 for the work-days per week, we arrive at a capability for laying new track of between 6 to 8 km/day. Again, it is unknown how many of what type units are involved. It is known that at least one railroad brigade is at work on BAM, but the number and type of sub-units is unknown.

That the Soviets are perhaps working at maximum capacity on rail line construction is indicated by their projection for the current Five Year Plan. They expect by 1980 to have opened "some 3,000 kilometres of new railway track. Another 2,800 kilometres of railways will be provided with double tracks on routes with intensive traffic."⁶² This is considerably lower than the Ninth Five Year Plan and could be a tacit recognition of the limitations imposed by the conditions on BAM as well as the need to divert resources for other projects.

One effect on their capabilities might well be the actual effectiveness of their much-touted mechanization.

Sources abound which depict various automated track-laying equipment, but at the same time reflects a great deal of man-power--and woman-power. In one instance, it was reported by an American observer on the scene that "an important part of yard and secondary track repair is done manually by local section gangs made up substantially of muscular women."⁶³ Further, as seen in the film "Soldat Bama," a good deal of work is accomplished with the use of hand tools such as open box wrenches to tighten bolts on the rails after they have been placed into position.

While the earlier historical treatment given of the Soviet railroad troops touched upon their capabilities in wartime conditions, there is unfortunately very little to go on to ascertain current effectiveness other than the experiential factors of the Baikal-Amur (BAM) project. While it is true that the conditions in the area are by no means "combat" conditions, they are nonetheless hostile environmentally for the area extends about 3,200 miles through generally rugged and, in some places, inhospitable stretches of country.⁶⁴

About 65 per cent of the line is in the region of permafrost which in some areas extends as much as 90 meters deep.⁶⁵ The frost affects not only the equipment (broken blades, cracked metal), but the men as well. When bad weather sets in, provisions--including food--could not be brought in and the troops had to sustain themselves with what little they had and by living off the land.⁶⁶ Floods have occurred which have threatened to destroy the structures set into concrete. In one case, the troops had to work all night in icy floodwaters working on a drainage channel.⁶⁷ Temperatures in the area often reach 45-50 degrees below zero for three to four months each year.

Compounding all of this is the fact that the line crosses a seismic zone noted for frequent and severe earthquakes; crosses more than 3,000 water obstacles including 16 rivers; and traverses seven mountain ranges, three of which require tunneling. One Soviet writer has stated that in the 3,200 km stretch of the BAM line, on the average one bridge is required per kilometer.⁶⁸

Despite these trying conditions, as of 1977 there were more than 3,500 various "structures" erected which included more than 120 large bridges and nearly 29 kilometers of tunnels.⁶⁹ These appear considerable accomp-

lishments for work undertaken in areas where road supply is either extremely limited or totally non-existent, where air supply is often the only artery open and then only in favorable weather conditions.⁷⁰ But again, these are not "combat" conditions and therefore it is difficult to assess the combat capability of the Soviet railroad troops.

What the BAM experience does say, however, is that this force is accustomed to operate independently, can use initiative to overcome obstacles of terrain and weather, is well-practiced in railroad construction and shoring-up operations, and is led by a well-trained, professional leadership. Their experience in bridging and spanning of gaps in general would stand them in good stead in any future military operation calling for such measures and, given a relatively protected environment in which to work, could well foster an effective combat railroad logistics artery to forward forces.

CONCLUSION

As is the case with the entire breadth of the Soviet military establishment, the USSR has placed great emphasis on the training and equipping of its railroad forces. In addition to the formal institutions set up specifically for that purpose, logistics organizations continually perform their mission thereby maintaining a high level of proficiency. This may well be said for the Soviet railroad troops. Given the primitive conditions extant on the BAM line, the degree of training, and the sophisticated railroad equipment in the inventory, one may conclude that this organization is prepared for satisfactorily supporting a forward combat force with essential material in any future conflict.

It may well be said that a railway line of communications, as Sokolovski pointed out, is extremely vulnerable and therefore should not be relied upon too heavily. But in the face of the two major threats--air interdiction and guerrilla activity--the Soviet armed forces have made great strides in the development of a protective air defense umbrella in the tactical environment to counter the first, and are conducting combat training of the railroad troops concurrent with their daily activities to diminish the effects of the second.

Further, the introduction of new mechanized railroad construction equipment to span water and other barriers implies a positive intent to be prepared to move into areas newly acquired as opposed to restoring spans in areas to the rear for withdrawal operations. American railway observers on the ground have pointed out the vast reserves of steam locomotives which are obviously in excess to current needs. For what purposes are these engines intended? How are the costs entailed to be justified? Again, these tie in with the building of a substantial railway reserve for "future operations" in areas which may not have sufficient diesel fuel or electricity to support contemporary locomotive equipment.

This study has sought to draw together whatever material could be found in the open sources to provide the reader with some insight as to the organization, mission, capabilities, equipment, and general employment of the Soviet railroad troops. Contemporary Soviet thought as to strategic employment of this force provides a backdrop against which this force is contrasted. Against such a background, it can be seen that the Soviet railroad troops are indeed a viable, well-trained and professional force that should not only not be ignored as a logistics force in any future operation, but which stand out as an indicator of a possible cognition on the part of the Soviets of the need to be prepared for supporting a protracted conflict--in itself a tacit admission of doubt as to the efficacy of a "short, victorious war."

A study of Russian or Soviet history will clearly show that attempts are made to hedge all bets. Once all exigencies are covered, the paths of least resistance are followed. If these result in success, then they are followed to the neglect of the remaining paths. At present, a continuing build-up of the Soviet railroad troops appears to be just such a contingency--to be used as and when needed.

ANNEX A

TYPES OF U.S. ARMY TRANSPORTATION RAILWAY UNITS

(Excerpted from FM 55-20)

Railway Engineering Co. Maintenance and repair of railroad track, bridges, and buildings, within a railway division of 90-150 miles.

Railway Equipment Maintenance Co. Organizational and direct support maintenance on motive power and rolling stock. Capability includes organizational and direct support maintenance for approximately 40 diesel-electric locomotives and 800 railway cars, and can inspect 2,000 cars daily.

Train Operating Co. Provides road and yard personnel for the operation of railway locomotives and trains. Provides 40 train crews daily for one rail division.

Electric Power Transmission Co. Maintains and repairs electric power transmission facilities.

Diesel-Electric Locomotive Repair Co. Performs general support maintenance on 25 diesel-electric locomotives and/or railway cranes per month.

Railway Car Repair Co. Performs general support maintenance of 2,500 total railway cars at a rate of 600 railway cars per month.

As a guide, one U.S. Army Transportation Railway Battalion normally is responsible for providing transportation over a rail division of between 90-150 miles.

FOOTNOTES

¹Unless otherwise noted, basic history is excerpted from "Zheleznodorozhnye Voiska," Sovietskaia Voennaia Entsiklopedia, Vol. 3, (1977), pp. 321-322.

²K. P. Terekhin, A.S. Taralov, and A.F. Tomashevskii, Voiny Stal'nykh Magistralei, Moscow, 1969, p. 115.

³V. Ocharov, "O Chem Stuchat Kolesa," Komsomolskaia Pravda, 3 September 1976, p. 4.

⁴Col. General A. Kriukov, "The Soviet Railway Troops," Soviet Military Review, No. 8, (1974), p. 2.

⁵ibid., p. 4.

⁶Captain V. Glazkov, "Most Na Trasse BAMA," Tyl i Snabzhenie, No. 9, (1975), pp. 47-49.

⁷"Sluzhba Voennykh Soobshchenii," Krasnaia Zvezda, 30 August 1977, p. 4.

⁸DA Field Manual 55-20, Army Rail Transport Operations and Units, June 1974.

⁹Col. General P. A. Kabanov, Stal'nye Peregony (Moscow: Voenizdat, 1973), pp. 320-322. General Kabanov cites situations in which the Soviet railroad troops took control of towns before the arrival of regular forces.

¹⁰Sovietskaia Voennaia Entsiklopedia, Vol. 3, p. 322.

¹¹ibid.

¹²V. Shalkeev, "Kilometry Muzhestva," Krasnaia Zvezda, October 24, 1974, p. 1.

¹³Terekhin, op. cit., p. 83.

¹⁴ibid., p. 91.

¹⁵ibid., passim

¹⁶Shalkeev, op. cit., p. 1.

¹⁷Terekhin, op. cit., p. 36.

¹⁸extracted from Terekhin.

¹⁹Kriukov, op. cit., p. 3.

²⁰A. Kriukov, "Zheleznodorozhnye Voiska--Velikomu Oktobriu," Tekhnika i Vooruzhenie, No. 6, 1977, p. 1.

²¹Also designated as a section railway and road bridge. See USAREUR Pam 30-60-1, 25 April 1975, p. 145.

²²A. Kriukov, op. cit., p. 1.

²³ibid.

²⁴ibid.

²⁵ibid.

²⁶ibid.

²⁷ibid.

²⁸ibid.

²⁹ibid.

³⁰Graham Turbiville, "Soviet Logistic Support for Ground Operations," RUSI, Vol. 120, No. 3, September 1975, p. 66.

³¹Col. General Kriukov, op. cit., p. 4.

³²"Teplovoz-Iubiliar," Tekhnika Molodezhi, (January 1976), p. 47.

³³G. Alexeyev, "Development of Transport," Soviet Military Review, No. 8, (August 1976), p. 7.

³⁴General Major N. Chichikin, "Razvivat' Material'no-Tekhnicheskuiu Bazu Voinskikh Perevozok," Tyl i Snabzhenie, No. 4, (1975), pp. 71-77.

³⁵James R. Sullivan, Notes On USSR Railways And The Trans-Siberian Route, (Philadelphia: Penn. Central Transportation Co., 1975), p. 5.

³⁶ibid., p. 6.

³⁷ibid.

38"Magistral' v Budushchee," Tekhnika i Vooruzhenie, No.11 (1977), p. 5.

39^{ibid.}, p. 7.

40^{ibid.}, p. 6.

41^{ibid.}

42Soviet television film, "Soldat BAMA," aired in Moscow at 1000 hours, 7 August 1977, on the weekly Soviet military television program, Sluzhu Sovetskому Soyuzu (I Serve The Soviet Union).

43Iu. S. Krinov, Gordoe Zvanie, (Moscow: DOSAAF Publishing Organization, 1976), pp. 69-70.

44"Soldat BAMA"

45V. Ocharov, op. cit., p. 4.

46M. Ya. Parshin, Benefits of Members of the Armed Forces and Their Families, (Moscow: Military Publishing House, 1976), p. 43. (Also available as DDC Document # ADBO 17639L)

47"Voennie Uchilischa Tyla," Krasnaia Zvezda, March 8, 1975, p. 4. A similar announcement was featured in Krasnaia Zvezda on March 10, 1977, p. 4.

48"BAM: God Tret'ii," Krasnaia Zvezda, April 2, 1977, p.2.

49^{ibid.}

50Leo Heiman, "Soviet Invasion Weaknesses," Military Review, (August 1969), p. 42.

51U. S. Army trains usually contain about 20 cars.

52Sullivan, op. cit., p. 7.

53Statement by Dr. Arthur G. Volz, Visiting Professor of Military Studies, during one of his presentations at the USA Russian Institute, Garmisch, Spring 1977.

54V. D. Sokolovskii, Soviet Military Strategy, (Santa Monica: The Rand Corporation, 1963), p. 455.

⁵⁵ibid., p. 456.

⁵⁶ibid., p. 455.

⁵⁷ibid., p. 456.

⁵⁸ibid.

⁵⁹Colonel N. Malyugin, "Problems of Military Transportation," Soviet Military Review, No. 3, (March 1976), p. 26.

⁶⁰Sullivan, op. cit., p. 5.

⁶¹"Stal'nye Dorogi Strany," Pravda, August 3, 1975, p.1.

⁶²G. Alexeyev, op. cit., p. 6.

⁶³Sullivan, op. cit., p. 10.

⁶⁴V. Shalkeev, op. cit., p. 1.

⁶⁵M E. Adzhiyev, "Economic And Geographic Problems of the Baikal-Amur Railroad," Priroda, No. 8 (August 1975), p.4. The author states that in the last 200 years, there were 800 earthquakes in the region.

⁶⁶V. Timakov and O. Baroian, "i Mediki Stroiat BAM," Pravda, June 29, 1976, p. 3.

⁶⁷Vasiliy Kalinichev, "Baikal-Amur Railroad: A Road of Courage," Soviet Press Selected Translations, No. 78, (January 1978), p. 14.

⁶⁸"Magistral' v Budushchee," op. cit., p. 5.

⁶⁹"BAM: God Tret'ii," op. cit., p. 2.

⁷⁰Lt. Col. V. Isaev, "Veterinarnoe Obespechenie Voisk no BAME," Tyl i Snabzhenie, No. 4, (1977), p. 68.

BIBLIOGRAPHY

BOOKS

- Kabanov., P. A. Stal'nye Peregony. Moscow, 1973.
- Karaev, G. N. Vozniknovenie Zheleznodorozhnykh Voisk v Rossii (1851-1878). Moscow 1952.
- Krinov, Ia. S. Gordoe Zvanie. Moscow: DOSAAF Publishing Organization, 1976.
- Kumanev, G. A. Na Sluzhbe Fronta i Tyla. Moscow, 1976.
- Parshin, M. Ia. Benefits of Members of the Armed Forces and Their Families. Moscow: Military Publishing House, 1976. Defense Documentation Center Doc. #ADBO 176396.
- Sokolovskii, V. D. Soviet Military Strategy. Santa Monica: The Rand Corporation, 1963.
- Terekhin, K. P., Taralov, A.C., Tomashevskii, A.A. Voiny Stal'nykh Magistralei. Moscow, 1969.
- Wiener, Friedrich. The Armies of the Warsaw Pact Nations. Vienna: Carl Ueberreuter Publishers, 1976.

MANUALS

- DA Field Manual 55-20. Army Rail Transport Operations And Units. June 1974.
- USAREUR PAM. No. 30-60-1. Identification Guide, Part Two. 15 February 1974.
- USAREUR PAM. No. 30-60-1. Identification Guide, Part Three. 25 April 1975.

ARTICLES

- Adzhiyev, M.E. "Economic And Geographic Problems of the Baikal-Amur Railroad," Priroda, No. 8, (August 1975), pp. 3-11.
- Alexeyev, G. "Development of Transport," Soviet Military Review, No. 8, (August 1976), pp. 6-8.
- Chichikin, General-Major N. "Razvivat' Material'no-Tekhnicheskuiu Bazu Voinskikh Perevozok," Tyl i Snabzhenie, No. 4, (1975), pp. 71-77.

- Erickson, John. "Soviet Ground Forces And The Conventional Mode of Operations," RUSI, Vol. 121, No. 2, (June 1976), pp. 45-49.
- Glazkov, Captain V. "Most Na Trasse BAMA," Tyl i Snabzhenie, No. 9, (1975), pp. 47-49.
- Heiman, Leo. "Soviet Invasion Weaknesses," Military Review, (August 1969), pp. 38-45.
- Isaev, Lt. Col. V. "Veterinarnoe Obespechenie Voisk Na BAME," Tyl i Snabzhenie, No. 4, (1977), pp. 68-70.
- Kalinichev, Vasiliy. "Baikal-Amur Railroad: A Road of Courage," Soviet Press Selected Translations, No. 78-1, (January 1978), pp. 13-15.
- Kriukov, Col.-General A. "The Soviet Railway Troops," Soviet Military Review, No. 8, (1974), pp. 2-4.
- "Zheleznodorozhnye Voiska--Velikomu Oktobriu," Tekhnika i Vooruzhenie, No. 6, (1977), pp. 1-3.
- Maigorov, Ia. "Kommunisty Na Bame," Kommunist-Vooruzhennykh Sil, No. 4, (1975), p. 50.
- Maliugin, Colonel N. "Problems of Military Transportation," Soviet Military Review, No. 3, (March 1976), pp. 25-27.
- Ogarkov, N. V., ed., "Zheleznodorozhnye Voiska," Sovietskaia Voennaia Entsiklopediia, Vol. 3 Moskva: Voennoe Izdatel'stvo Ministerstva Oborony SSSR, 1977, pp. 321-322.
- Ovcharov, V. "O chem Stuchat Kolesa," Komsomol'skaia Pravda, 3 September 1976, p. 4.
- Shalkeev, V. "Kilometry Muzhestva," Krasnaia Zvezda, October 24, 1974, p. 1.
- Shniper, R. I. "Within The Forseeable Future," Ekonomika i Organizatsia Promyshlenovo Proizvodstva, No. 2, March-April 1976, pp. 22-35, as translated in The Current Digest of the Soviet Press, Vol. 28, No. 19, June 9, 1976, pp. 1-3.

Sullivan, James R. Notes On USSR Railways And The Trans-Siberian Route, Philadelphia: Penn. Central Transportation Co., 1975.

Tenetov, P. "K Vostoku ot Baikala," Pravda, January 19, 1976, p. 4.

Timakov, V. and Baroian, O. "i Mediki Stroiat BAM," Pravda, June 29th 1976, p. 3.

Turbiville, Graham. "Soviet Logistic Support For Ground Operations," RUSI, Vol. 120, No. 3, September 1975, pp. 65-67.

Vasil'ev, P. "i Soldaty Stroiat BAM," Sovietskii Voin, No. 4, 1975, pp. 37-40.

UNSIGNED ARTICLES

"BAM: God Tretii," Part 3, Krasnaia Zvezda, 2 April, 1977, p. 2.

"Za Vysokuiu Effektivnost' Voiskovogo Khoziaistvo," Krasnaia Zvezda, 6 October 1976, p. 2.

"Magistral' v Budushchee," Tekhnika i Vooruzhenie, No. 11, 1977, pp. 4-7.

"Magistral' Rosta," Krasnaia Zvezda, 5 October 1976, p.2.

"Pervoprokhodtsy," Krasnaia Zvezda, November 20, 1974, p. 1.

"Sluzhba Voennykh Soobshchenii," Krasnaia Zvezda, August 30, 1977, p.4.

"Stal'nye Dorogi Strany," Pravda, 3 August 1975, p. 1.

"Teplovoz-Iubil'ar," Tekhnika Molodezhi, January 1976, p.47.

"Voennye Uchilishcha Tyla," Krasnaia Zvezda, 8 March 1975, p.4.

"Vremia Nabirat' Skorost'," Pravda, September 7, 1976, p.2.